USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

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Congratulations on receiving an Artemis I Moon Tree seedling!

This guidebook contains information and resources for your Moon Tree's planting and care.

MOON TREE SEEDLING PLANTING AND CARE GUIDEBOOK

TREE ANATOMY AND PARTS

Five tree species were sent aboard the Artemis I mission:

Deciduous tree species

American sycamore: https://www.fs.usda.gov/database/feis/plants/tree/plaocc/all.html

Sweetgum: https://www.fs.usda.gov/database/feis/plants/tree/liqsty/all.html

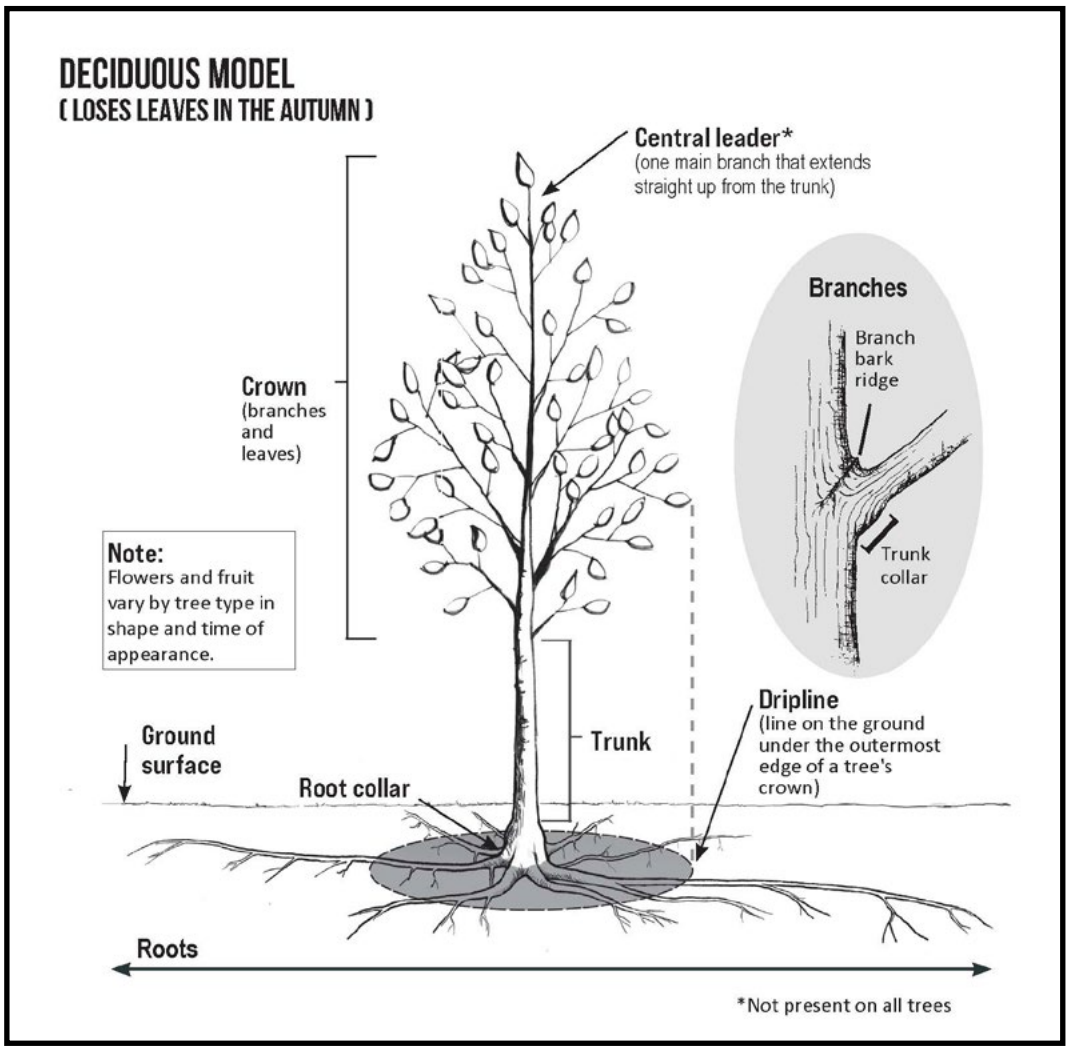
Evergreen tree species

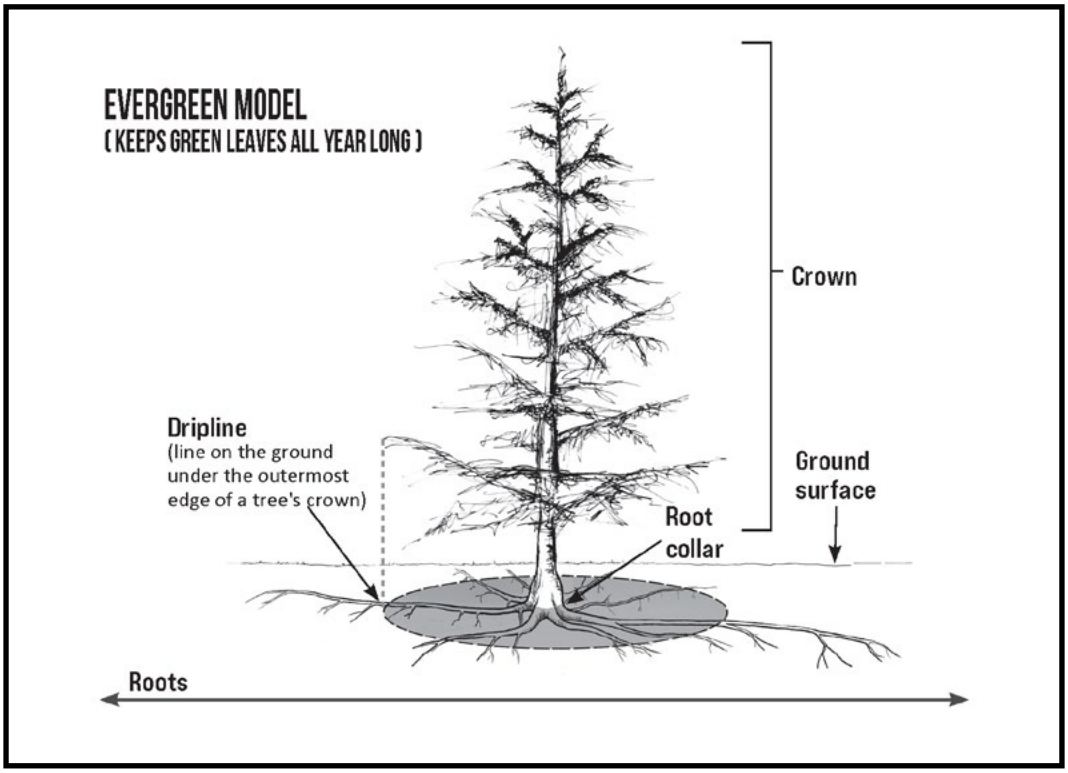
Douglas-fir: https://www.srs.fs.usda.gov/pubs/misc/ag_654/volume_1/pseudotsuga/menziesii.htm

Loblolly pine: https://www.fs.usda.gov/database/feis/plants/tree/pintae/all.html

Giant sequoia: https://www.fs.usda.gov/database/feis/plants/tree/seqgig/all.html

The following overview of basic tree anatomy and parts will help in understanding the planting and maintenance of your Moon Tree.





PLANTING PREPARATION

Handle seedling with care

Handle your Moon Tree seedling gently and as little as possible. Your seedling's survival and growth depend on new root growth. Root growth can be reduced by dropping or otherwise roughly handling your seedling. A 5-gallon bucket is a good way to move a small seedling around prior to planting. If the seedling is in a large pot, always handle it by the pot, not by lifting or carrying it by the stem.

Keep seedling cool

Warm seedlings use stored energy that could be used for growth after planting. If you can't plant your Moon Tree seedling immediately, store it in a refrigerator (at 35 °F) in the packaging material it arrived in. Check your seedling frequently. Ideally, your Moon Tree seedling should be planted within a week of arrival.

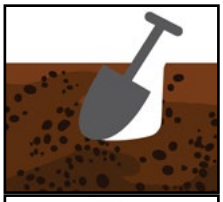
Call before you dig

Do not dig until utility companies confirm there are no buried utilities. Visit the 811/Call Before You Dig website at https://call811.com/ for more information.

PLANTING INSTRUCTIONS

Your Moon Tree seedling should be planted at its permanent location. Do not move your seedling once it has been planted.

Planting steps

	Dig a hole deep enough for the root plug. Spades and shovels work well. Keep foreign matter (leaves, sticks, duff, rocks, snow, etc.) out of the hole.
	Place your seedling near the center of the hole, with the tip of the root plug about 0.5 to 1 inch below the soil line. Planting a little too deep is better than too shallow as long as you don't bury any foliage.
	Fill the hole with the soil that was removed. Gently firm the soil around the roots. Leave no air spaces. Be sure to use moist soil to fill the hole, but don't use heavy pressure that will compact the soil.
	Water your seedling. (See p. 4 for more information.)
	Install a weed barrier. It is essential that the weed barrier allow transmission of air and water.
	Put a 2- to 4-inch layer of mulch over the backfilled area but no deeper. Too much mulch can prevent air and water from reaching the roots. Pull mulch away from the trunk so that none touches the bark. Mulch becomes soil.
	Install the following as seedling protection: - Perimeter fence in a 3-foot diameter around the entire planting area to prevent accidental tree damage. - Mesh cage directly around the seedling to prevent damage from animals such as rabbits and mice. (See p. 6 for more information.)

Additional planting resources

Arbor Day Foundation: https://www.arborday.org/trees/planting/containerized.cfm

Nebraska Forest Service: https://nfs.unl.edu/publications/how-to-plant-a-tree

Texas A&M Forest Service: https://tfsweb.tamu.edu/arborday/plantingsteps/

MOON TREE PLANTING AND MAINTENANCE SCHEDULE

<table>
<tr><th rowspan="2">Type of care</th><th colspan="4">Timeline</th></tr>
<tr><th>At planting</th><th>Years 1–3</th><th>Years 4–10</th><th>After 10 years</th></tr>
<tr><td>Water</td><td>5 gallons</td><td>Correct amount is critical from spring through autumn. (See p. 5 for more information.)</td><td colspan="2">Water as needed from spring through autumn.</td></tr>
<tr><td>Mulch</td><td>2–4 inches deep, not against the trunk</td><td colspan="3">Check and adjust mulch level in spring.</td></tr>
<tr><td>Weeding</td><td colspan="4">Yes</td></tr>
<tr><td>Protect trunk</td><td>Yes</td><td colspan="2">Check trunk protection (i.e., wire mesh cage or similar) in spring and autumn. (See p. 6 for more information.)</td><td>N/A</td></tr>
<tr><td rowspan="2">Prune</td><td rowspan="2">N/A</td><td colspan="2">Deciduous trees: every 1–2 years</td><td>Deciduous trees: once every 4–7 years</td></tr>
<tr><td colspan="3">Evergreen trees: only as needed</td></tr>
<tr><td>Check health</td><td>N/A</td><td colspan="3">Inspect leaves, branches, crown, and trunk every year. (See p. 8 for more information.)</td></tr>
</table>

For videos on how to care for trees, check out Arbor Day Foundation's Tree Care Video Library at https://www.arborday.org/trees/video-library.cfm.

WATERING

An important factor in tree survival is providing the right amount of water. The first 3 years are most critical but pay attention to watering needs throughout the tree's life.

Tree roots need oxygen. Soil saturation with water for more than 24 hours can prevent roots from getting oxygen. Therefore, watering too much is as dangerous as watering too little (and is harder to correct).

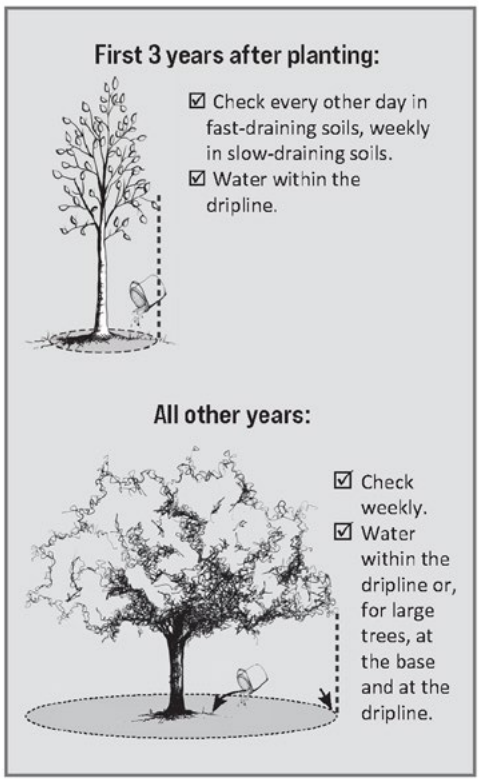
Where?

Water the area within the dripline, which is the area directly located under the outer circumference of the tree branches (or an imaginary circle on the ground below the outer edge of the tree's canopy). For large trees, focus watering on the area within 6 feet of the trunk and at the dripline.

When and how much?

At planting, water your seedling with 5 gallons of water. An easy way to ensure you provide enough water is to fill a 5-gallon bucket and use that to water the tree. Water slowly, and ensure the water sinks into the ground close to the base of the seedling and doesn't run-off. (Note: If you have been experiencing rainy weather, your soil may already be quite moist. If this is the case, less water may be needed at planting.) After the initial planting, begin checking soil moisture and water the seedling when necessary, until the soil freezes. Continue checking soil moisture levels and watering as needed from spring through autumn for the first 3 years (at least) of your seedling's growth.

Watering frequency will depend on the soil and weather. Hot and dry weather will result in more watering needs than cool and/or wet weather. In addition, soils that drain quickly (sandy soils) will require more frequent watering than those that drain slowly (clayey soils).


First 3 years after planting:
☑ Check every other day in fast-draining soils, weekly in slow-draining soils.
☑ Water within the dripline.
All other years:
☑ Check weekly.
☑ Water within the dripline or, for large trees, at the base and at the dripline.

To determine your soil's drainage rate, dig a hole 18 inches deep and fill it with water. Let it drain completely. Refill it with water, and time how long it takes for the water to drain:

Less than 2 hours = Very fast drainage rate

18 hours or more = Very slow drainage rate

The best way to know how often and how much to water is to check the soil moisture at 6 inches below the surface and water when dry. This can be done by placing a popsicle or bamboo stick in the soil, leaving it there for 30 seconds, and then removing it slowly. Soil that is moist will leave bits of dirt clinging to the stick and the stick will be discolored. A clean (not discolored) stick means dry soil that should be watered. You can also purchase a soil meter that measures soil moisture levels.

For the first 3 years after planting: If the soil is dry, provide about 1.5 gallons of water for every inch in trunk diameter measured at the ground.

All other years: Because soil type and weather conditions influence the demand for water, irrigation schedules and amounts will vary.

WEEDS AND MULCHING

Weeds are your number one enemy. Control weeds for at least 3 years—the longer, the better. Weeds rob seedlings of moisture and nutrients. Weed control can make the difference between life and death for your seedling. You can control weeds through a weed barrier and mulch. Mulch inhibits weed growth and improves seedling survival and growth by reducing evaporation from soil and lowering soil temperatures. Mulch effectiveness can be improved by first laying down a weed barrier or landscape mat that allows water and air to penetrate to the soil. Newspaper can also kill grass and weeds (use a 5-page layer of newspaper over the area). Organic mulches (e.g., wood chips or pine straw) are best.

PROTECTION

Young Moon Trees will require protection from animals, people, weeds, and other potential hazards. Ideally, seedlings should be protected with a mesh cage and a perimeter fence.

Mesh cage

(interior open-topped cage directly around the seedling)

Purpose: Prevent damage from animals such as rabbits and mice.

Placement: Surround the seedling with a 12- to 18-inch diameter cylinder.

Height: 12 to 18 inches tall

Materials: Construct using 0.5-inch woven wire mesh or similar. A wooden or metal stake can be used to keep this cylindrical cage in place. Burying the bottom 2 or 3 inches of the cylinder can further protect the tree from burrowing pests.

Mesh cage should be removed before it impedes tree growth.

Perimeter fence

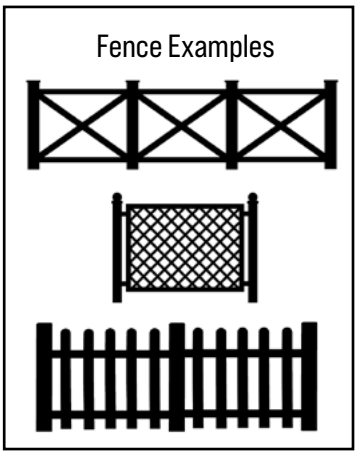
(exterior fencing for the entire planting area)

Purpose: Prevent accidental tree damage from things such as lawn maintenance equipment or playing children.

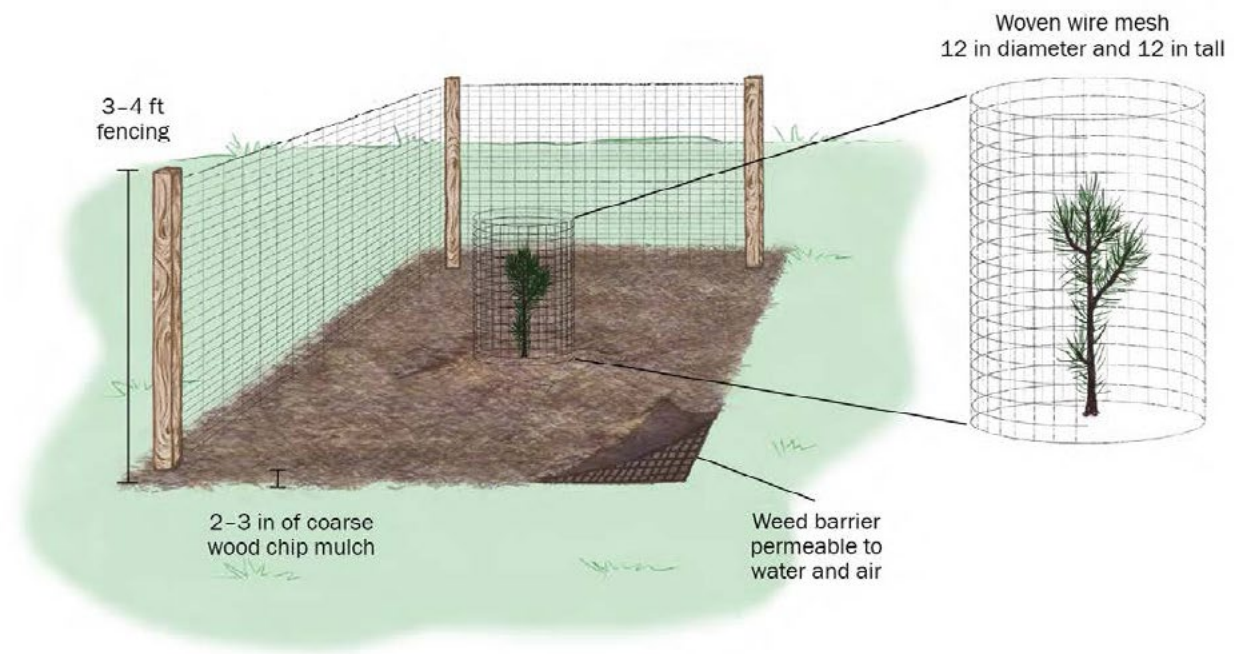
Placement: Place at least 3 feet from the seedling.

Height: 4 feet tall (Note that planting locations with browsing deer, elk, or moose may require taller fencing.)

Materials: A variety of materials such as wire, wood, or vinyl could be used, but the materials must be porous enough to allow sunlight to reach the tree. Fences made of wood, vinyl, metal, or a combination of all three will work.



Your completed protection could look something like the following example. It may vary based upon the type of perimeter fence chosen.



PRUNING

Why prune?

The main reasons for pruning trees are safety, health, and aesthetics. Pruning can encourage trees to develop a strong structure and reduce the likelihood of damage during severe weather.

Pruning for safety involves removing branches that could fall and cause injury or property damage, trimming branches that interfere with lines of sight on streets or driveways, and removing branches that grow into utility lines.

Pruning for health involves removing diseased or insect-infested wood, thinning the crown to increase airflow and reduce some pest problems, and removing crossing and rubbing branches.

Pruning for aesthetics involves enhancing the natural form and character of trees or stimulating flower production.

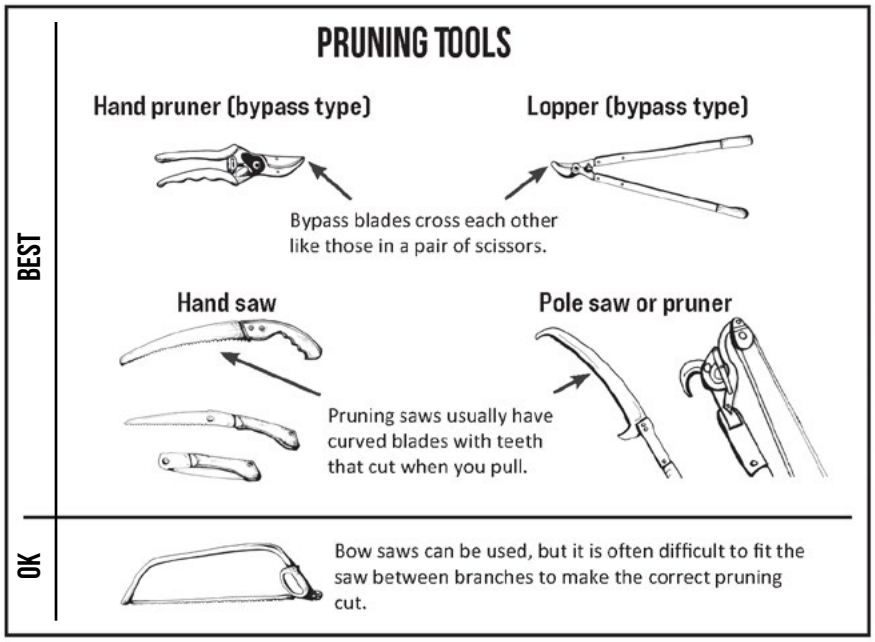
Pruning safety

Remember:

⚠ **Electricity flows through branches.** Never prune trees or branches that are within 10 feet of utility lines; instead, contact your local utility company. Do not top your tree.

⚠ **Ladders and trees do not mix**. If pruning cannot be done with both feet on the ground, hire an arborist. When hiring an arborist, select someone who has general liability insurance.

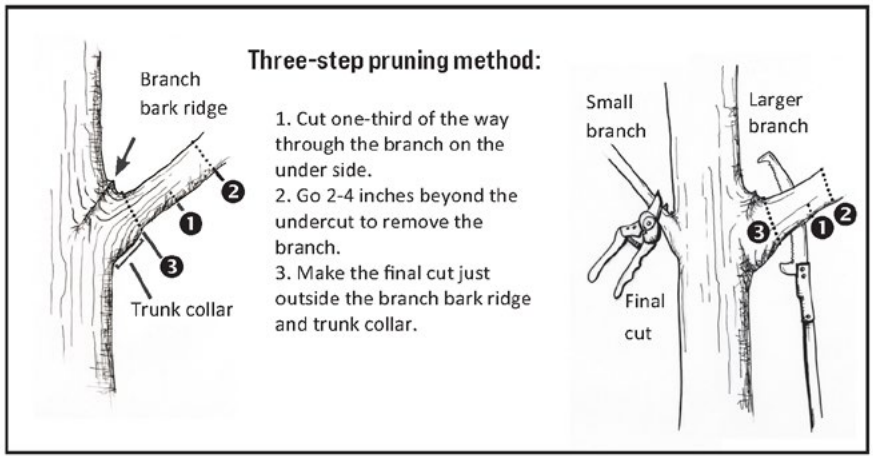
⚠ **Chainsaws cut limbs.** If power equipment is required, hire an arborist.


PRUNING TOOLS
BEST
Hand pruner (bypass type)
Lopper (bypass type)
Bypass blades cross each other like those in a pair of scissors.
Hand saw
Pole saw or pruner
Pruning saws usually have curved blades with teeth that cut when you pull.
OK
Bow saws can be used, but it is often difficult to fit the saw between branches to make the correct pruning cut.

Where and how to cut

Prune branches at the trunk collar (see images below). A flush cut or leaving a stub will interfere with proper wound healing. Wound dressing is unnecessary. Support the branch with one hand while you make the cut to prevent the bark from ripping. If the branch is too large to support, use the three-step method (see details below). For the final cut (step 3), look for the branch bark ridge and trunk collar. Begin the cut just outside of the branch bark ridge, and angle down away from the trunk. Stay close to the trunk collar without cutting into it.

Do not remove more than 25 percent of the live crown at a time. For deciduous trees, continue annual pruning of side branches until you have a clear bole of at least 9 feet. Some owners continue side pruning deciduous trees until 25 feet of clear, straight trunk is achieved. Evergreen trees need not be pruned to have clear trunks, although some individuals prefer it. Regardless, dead limbs should be pruned.


Branch bark ridge
Trunk collar
Three-step pruning method:
1. Cut one-third of the way through the branch on the under side.
2. Go 2-4 inches beyond the undercut to remove the branch.
3. Make the final cut just outside the branch bark ridge and trunk collar.
Small branch
Larger branch
Final cut

When to prune

Pruning should be accomplished while trees are dormant in late winter or early spring, just before bud break. Winter is best time of year to prune because branches are easy to see, diseases cannot be spread, and stress to the tree is minimal.

Tree type	First 10 years	10+ years after planting
Deciduous shade trees	Once every 1–2 years	Once every 4–7 years
Evergreen trees	Only as needed	Only as needed

For deciduous trees, begin pruning 1 year after planting and prune lightly every year or every other year. After 10 years, frequency of pruning depends on the type of tree and amount of shade the canopy receives but will often be needed every 4 to 7 years. Pruning lightly and more frequently is better than pruning heavily and less often.

Evergreen trees usually need pruning only if they are diseased or their branches need to be raised up from the ground. In either case, prune off the entire branch.

Removal of broken, dead, or rubbing branches as well as branches sprouting from the base of the trunk can be done every year.

CHECKING TREE HEALTH

Tree health can be difficult to determine, but checking your Moon Tree in early spring when growth resumes and in mid-summer may help you notice problems as they appear. For example, is the current year's growth much less than past years' growth? Fast growth does not mean good health, but a dramatic reduction in growth rate may be an indication of poor health.

Complete the Project Learning Tree "Trees in Trouble" activity worksheets to take a complete inventory of your Moon Tree's health each year: https://www.plt.org/wp-content/uploads/pdf/PLT_LearnAboutForests_TreesinTrouble.pdf.

If your Moon Tree is showing signs of damage or disease, please contact an expert for support. Potential organizations with experts on staff include:

- County Cooperative Extension office with programs such as Master Gardeners: https://www.nifa.usda.gov/about-nifa/how-we-work/extension/cooperative-extension-system
- State universities and local colleges that offer forestry degrees
- Local arborists (Local arborists usually work for a company and may charge a fee for their services.)
- State forestry agency
- Local USDA Forest Service office: https://fs.usda.gov

Illustrations on pages 1, 2, 5, and 7 are from "Tree Owner's Manual for the Northeastern and Midwestern United States" (NA-FR-04-07).

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